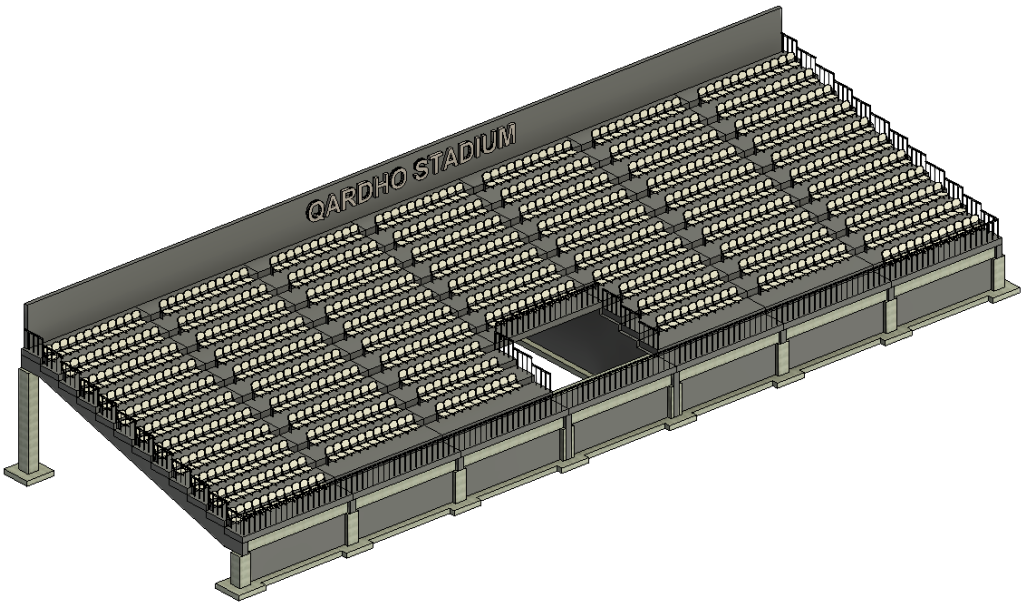

QARDHO BOOBE STADIUM WEST STAND RENOVATION

Prepared For:

The City of Qardho

Prepared By:

AX Engineering

April 23, 2023

Basis of Design Report

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1.0 Introduction

As part of its ongoing commitment to enhance community facilities and public enjoyment, the City of Qardho is initiating a comprehensive renovation of the Qardho Boobe Stadium. This project is focused not only on increasing the stadium's seating capacity by constructing a new west stand but also on substantially improving the overall visitor experience and ensuring the highest standards of safety. The new west stand will provide seating for an additional 775 spectators, reflecting the city's dedication to accommodating a growing number of sports fans and eventgoers.

The renovation will extend beyond seating to include the construction of modern ground amenities such as updated bathrooms and a concession stand, aimed at enhancing convenience and comfort for all visitors. These improvements are designed to modernize the stadium, aligning it with contemporary standards for sports venues.

Key stakeholders involved in this project include the City of Qardho officials who are overseeing the planning and funding, AX Engineering who has been commissioned to prepare the renovation plans, and potential contractors who will be competitively selected to execute the construction work. Each entity plays a crucial role in the successful delivery of this renovation, from initial designs and securing funding to the final construction and finishing touches.

By upgrading the Qardho Boobe Stadium, the city aims to foster a more engaging and safer environment for families, athletes, and sports fans, ensuring that it continues to serve as an asset for the community.

This document will serve as a preliminary basis of design of this project including:

- Structural System
- Floor plans
- ROM Cost Estimate
- Preliminary Construction Documents

1.1 Project Description

The Qardho Boobe Stadium, a landmark that has served the community for decades, is encircled by five existing walls, each with varied dimensions as depicted in Figure 1. Currently, the east wall of the stadium houses a non-seated observation area. This space, while historically significant for offering unrestricted views during events, has been underutilized in recent years and no longer meets modern standards for comfort and accessibility.

Figure 1: Existing Stadium Layout and Exterior Wall Dimensions

In recognition of the need for modernization and to enhance the utility of the space, the proposed renovation involves replacing this observation area with a new stand. This new construction will be centrally aligned with the playing pitch, ensuring optimal sightlines for spectators, and is designed with the capacity to expand to the east, north, and south sides in future developments.

2.0 Structural System

2.1 Main Framing Components

The stand will be constructed out of a mix of columns and walls to transfer the loads of the horizontal landings for the seats to the ground. Shallow foundations will be used to support the columns and walls, refer to figure 2.

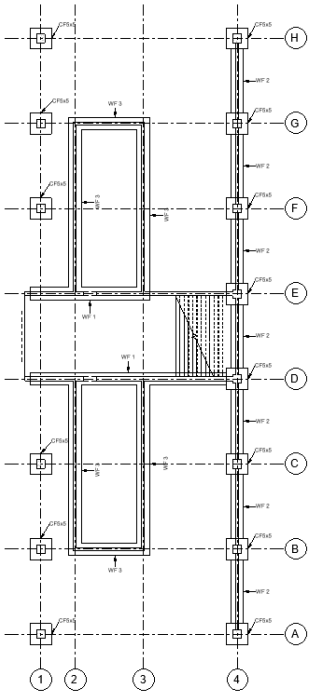


Figure 2: Foundation Plan

The structural 24” x 24” columns are only located along gridlines 1 and 2, with the columns along gridline 1 being 16’-0” tall and the columns along gridline 2 being 5’-0” tall, refer to figure 3, and will be spaced at 20’ – 0” on center.

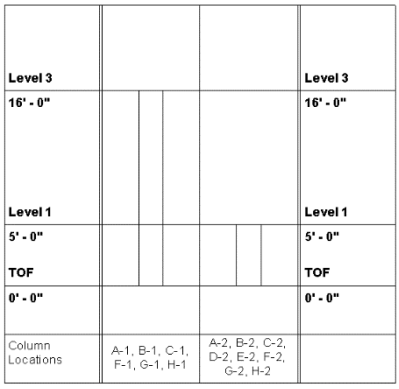


Figure 3: Graphical Column Schedule

There will be 12” thick raker beam with (12) steps bearing on each column along the letter grid lines and will support the horizontal landings for the seats, refer to figure 4.

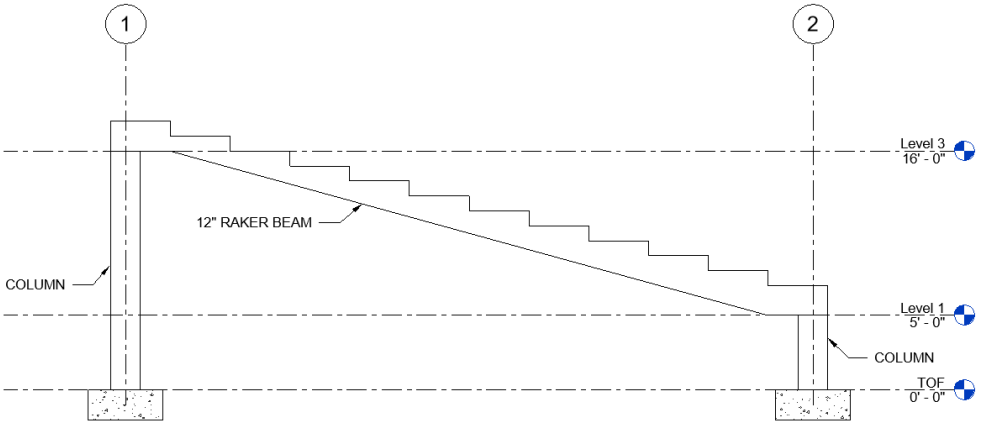


Figure 4: Typical Raker Beam elevation

Finally, a 4’-0” wide, 12” thick horizontal slab will be spanned between the raker beams to serve as the landing for spectator seating, refer to figure 5.

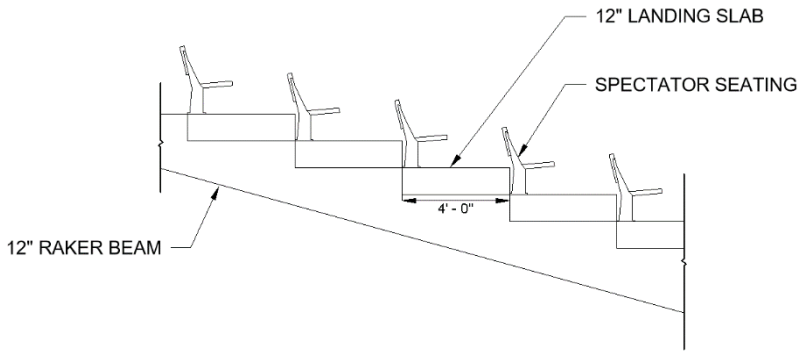


Figure 5: Typical Section Cut of Landing Slab and Raker Beam Interface

Finally, all the loads transferred from the landing slabs to the raker beams to the columns will be transferred to shallow foundations at grade.

2.2 Structural Load Development

The stadium stand will be designed for the following gravity loads:

Load Components

Dead Loads (Selfweight)	psf
Landing Slab (t=12 in)	150 psf

Superimposed Dead Loads	psf
Stadium seats	10 psf

Live Loads	psf
Non-reducible Live Loads	100 psf

Table 1: Unfactored Gravity Design Loads

For Lateral loads, the stadium will be designed for the following loads:

Lateral Loads

Wind Loads	psf
Wind Load	7 psf

Horizontal Sway Forces	plf
Parrallel to Seats	24 plf
Perpendicullar to Seats	10 plf

Table 2: Unfactored Lateral Design Loads

Self-straining loads like thermal loads resolved using expansion joints between the landing slabs by maintaining a 0.25” separation between adjoining landing slabs.

3.0 Floor Plans

The west stand of the Boobe Stadium will be designed for maximum functionality by only providing one type of seating at the 11 landing levels, and (2) male and female bathrooms located off the entrance corridor with (7) stalls in each bathroom, refer to figures 6 for preliminary floor and seating plans.

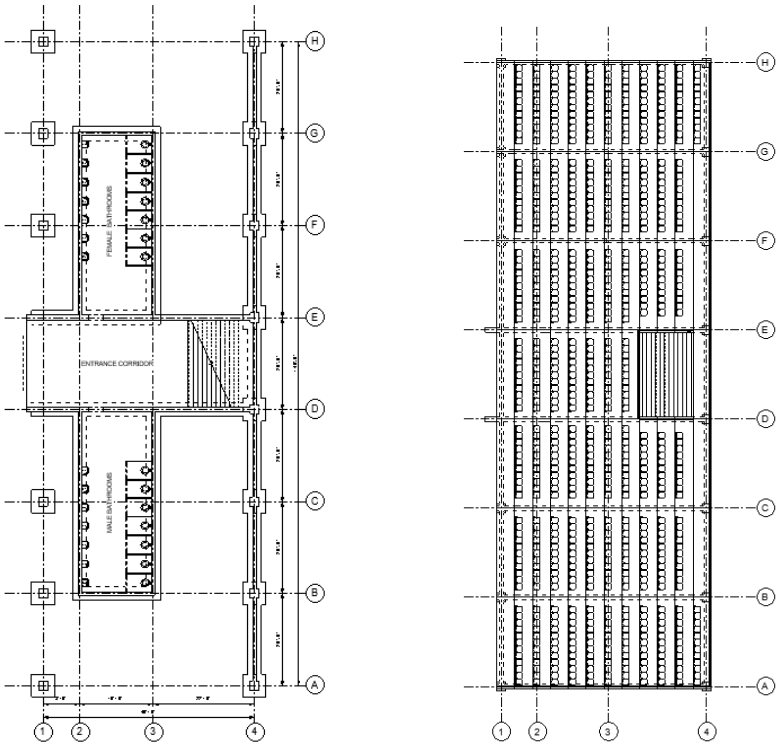


Figure 6: Level 0 Floor Plans and Landing Level Seating Plan

4.0 Cost Estimate

A rough order of magnitude (ROM) estimate was developed based on the preliminary design of this proposed stand.

This ROM cost estimate will consist of the following:

- Site Preparation Costs
- Foundation and Substructure Costs
- Superstructure Costs
- Seating and Amenities Costs
- Finishes and Safety Costs
- Contingency Costs

4.1 Site Preparation Costs

Land Acquisition: The cost of purchasing of the land for the new stand will be considered zero since the site of the new stand will be within the Boobe Stadium enclosure and is owned by the city of Qardho.

Site Clearing and Excavation: The costs for clearing the site and excavating it to prepare for construction will be based on an estimated $100 per cubic yard of materials extracted for preparing the site. Since this project will have (14) column spread footings and (16) wall footings with a total volume of approximately 1600 cubic feet or 133.33 cubic yards, the total cost of site clearing, and excavation is **$13,333**.

This is a simplified conservative approach, and it is recommended that a more specific quote is solicited based on the details provided above, from a local contractor or excavation company who can consider all the relevant local factors to provide a more accurate estimate.

4.2 Foundation and Substructure Costs

Preliminary designs of the west stand include (14) column footings and (16) wall footings as well as (3) 6” slabs.

Refer to table 3 for a schedule of all the foundations and substructure in this project.

FOUNDATION AND SUBSTRUCTURE SCHEDULE				
DESIGNATION	LENGTH	WIDTH	THICKNESS	VOLUME
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	48.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	48.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
CF 5x5	5' - 0"	5' - 0"	2' - 0"	50.00 CF
WF 1	50' - 8 1/8"	3' - 0"	1' - 0"	58.44 CF
WF 1	50' - 8 1/8"	3' - 0"	1' - 0"	107.37 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	45.00 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	45.00 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	45.00 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	36.25 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	45.00 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	45.00 CF
WF 2	18' - 0"	3' - 0"	1' - 0"	45.00 CF
WF 3	390' - 2 5/8"	3' - 0"	1' - 0"	1159.57 CF
6" Foundation Slab	19' - 0"	49' - 4 1/8"	0' - 6"	468.47 CF
WF 3	39' - 2"	3' - 0"	1' - 0"	97.74 CF
WF 3	16' - 8"	3' - 0"	1' - 0"	39.73 CF
WF 3	39' - 2"	3' - 0"	1' - 0"	93.33 CF
6" Foundation Slab	39' - 2"	15' - 4"	0' - 6"	300.20 CF
WF 3	39' - 2"	3' - 0"	1' - 0"	97.74 CF
WF 3	16' - 8"	3' - 0"	1' - 0"	39.73 CF
WF 3	39' - 2"	3' - 0"	1' - 0"	89.42 CF
6" Foundation Slab	39' - 2"	15' - 4"	0' - 6"	300.20 CF

Table 3: Foundation and Substructure Schedule

The total volume of all the foundation and substructure elements is approximately 4700 cubic feet, which when adding a 15% approximate loss, comes to 5400 cubic feet or 200 cubic yards. Assuming $155 per cubic yard to purchase and pour the concrete foundations and superstructure, the estimated cost would be approximately $31,000. This includes $25,000 for the concrete itself and an additional $6,000 for the pouring process. It is important to note that this estimate should be refined by obtaining quotes from local suppliers and contractors to reflect local pricing and conditions.

To account for the cost of the rebar in this estimate, the rebar density will be taken as 150 lbs. per cubic yard, which comes out to 30,000 lbs. or 15 tons of rebar for the foundations and substructure. The estimated cost of the rebar needed for the project (15 tons) would be approximately $12,000, assuming a price of $800 per ton.

As such, the total cost of the foundations will come to **$43,000.**

4.3 Superstructure Costs

The superstructure of the stand will consist of the Columns, Raker Beams, Edge Beams, Walls, Roof Slabs and Landing Slabs.

Refer to tables 4-9 for schedules showing the volumes of all these elements.

COLUMN SCHEDULE		
DESIGNATION	DIMENSIONS	VOLUME
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	20.00 CF
C1	24 x 24	64.00 CF
C1	24 x 24	64.00 CF
C1	24 x 24	64.00 CF
C1	24 x 24	64.00 CF
C1	24 x 24	64.00 CF
C1	24 x 24	64.00 CF

Table 4: Column Schedule

RAKER BEAM SCHEDULES			
DESIGNATION	LENGTH	WIDTH	VOLUME
RB01	48' - 0"	1' - 0"	96.00 CF
RB01	48' - 0"	1' - 0"	96.00 CF
RB01	48' - 0"	1' - 0"	96.00 CF
RB01	48' - 0"	1' - 0"	96.49 CF
RB01	48' - 0"	1' - 0"	97.06 CF
RB01	48' - 0"	1' - 0"	96.00 CF

Table 5: Raker Beam Schedule

EDGE BEAM SCHEDULE			
DESIGNATION	DIMENSIONS	LENGTH	VOLUME
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	39.00 CF
B1	12 x 24	20' - 0"	40.00 CF
B1	12 x 24	20' - 0"	39.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B1	12 x 24	20' - 0"	38.00 CF
B2	12x18	16' - 0"	15.66 CF
B2	12x18	16' - 0"	15.66 CF
B2	12x18	16' - 0"	15.66 CF
B2	12x18	16' - 0"	15.66 CF
B2	12x18	16' - 0"	15.33 CF
B2	12x18	16' - 0"	15.33 CF
B2	12x18	16' - 0"	15.33 CF
B2	12x18	16' - 0"	15.33 CF

Table 6: Beam Schedule

WALL SCHEDULES			
DESIGNATION	LENGTH	WIDTH	VOLUME
W1	51' - 0 1/8"	1' - 0"	627.26 CF
W1	51' - 0 1/8"	1' - 0"	628.24 CF
W2	18' - 0"	0' - 8"	60.00 CF
W2	18' - 0"	0' - 8"	60.00 CF
W2	18' - 0"	0' - 8"	60.00 CF
W2	18' - 0"	0' - 8"	60.00 CF
W2	18' - 0"	0' - 8"	60.00 CF
W2	18' - 0"	0' - 8"	60.00 CF
W2	18' - 0"	0' - 8"	60.00 CF
W3	16' - 0"	0' - 8"	111.09 CF
W3	40' - 0"	0' - 8"	261.11 CF
W3	40' - 0"	0' - 8"	261.11 CF
W3	16' - 0"	0' - 8"	111.09 CF
W3	40' - 0"	0' - 8"	261.11 CF
W3	40' - 0"	0' - 8"	261.11 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	28' - 8 7/8"	0' - 2"	10.82 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.59 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	28' - 8 7/8"	0' - 2"	10.82 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.43 CF
W4	5' - 10 1/8"	0' - 2"	5.59 CF

Table 7: Wall Schedule

LANDING SLAB SCHEDULE	
DESIGNATION	VOLUME
12" LANDING SLAB	(81) X 82 = 6642 CF

Table 8: Landing Slab Schedule

ROOF SLAB	
DESIGNATION	Volume
BATHROOM ROOF SLAB	319.92 CF
BATHROOM ROOF SLAB	319.92 CF

Table 9: Bathroom Roof Slab Schedule

The total volume of concrete for the above structural components comes out to 11,952 cubic feet, which when adding a 15% approximate loss, comes to 13,750 cubic feet or 509 cubic yards. Assuming $155 per cubic yard to purchase and pour the concrete superstructure, the estimated cost would be approximately $78,895.

Additionally, to account for the cost of the rebar in this estimate, the rebar density will be taken as 150 lbs. per cubic yard, which comes out to $76,350 lbs. or 38 tons of rebar for these elements. The estimated cost of the rebar needed for the project would be approximately $30,400, assuming a price of $800 per ton.

As such, the total cost of the foundations will come to **$109,295.**

4.4 Seating and Amenities Costs

The seating and amenities costs for this project will be estimated from the total Cost of seats themselves and the Installation of restroom water closets and sinks.

This stand will have a total of (775) seats priced at $10 per seat and come out to a total of $7,750. Additionally, the (14) sets of water closets and sinks will cost $100 per set which comes out to $1400.

An estimated $2,000 is taken for the installation of all the seats and amenities giving a total estimated cost of **$11,150.**

4.5 Finishes and Safety

Standard metal guardrails will be provided throughout the stands at areas with potential fall risk. There will be a total of 176 linear feet of metal guardrails composed of 2 square inch horizontal railings and 1” vertical balusters spaced at 12” on center.

The estimated total cost to install 176 linear feet of standard metal guardrails is approximately $60 per linear foot which comes out to **$10,560.**

This is a conservative estimate that includes materials, labor, and an allowance for additional costs but it is recommended to solicit specific quotes from local vendors.

4.5 Labor and Contingency Costs

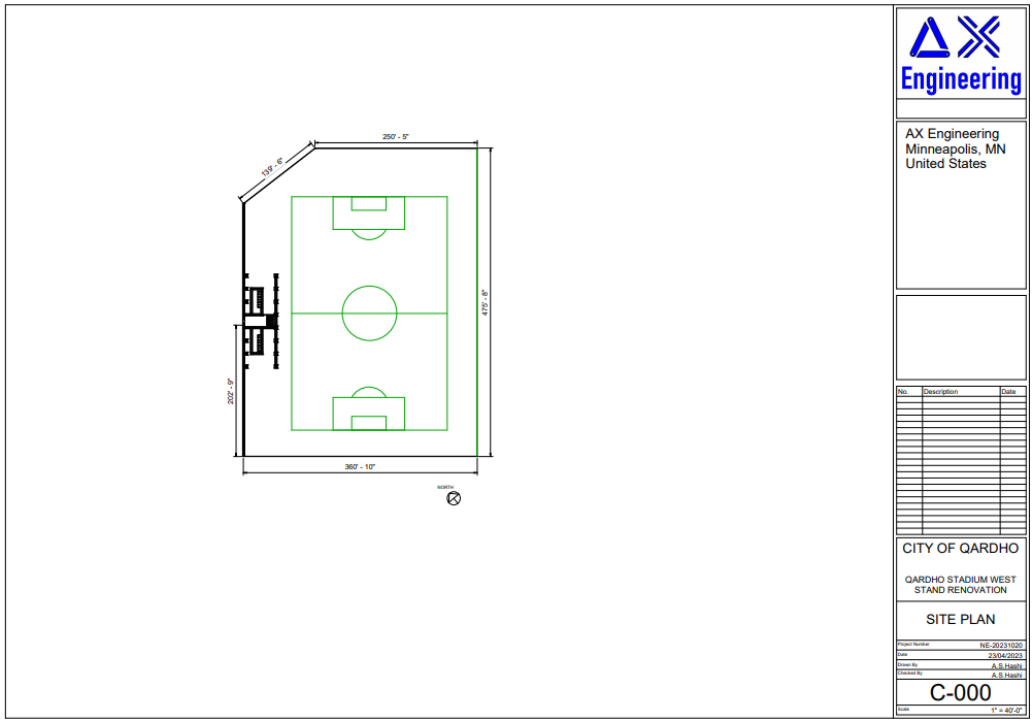
Due to the relatively low complexity of this project, a labor multiplier of 10% and a contingency of 8% will be included in the final cost estimate to account for everything related to potential deviations and cost overruns during construction.

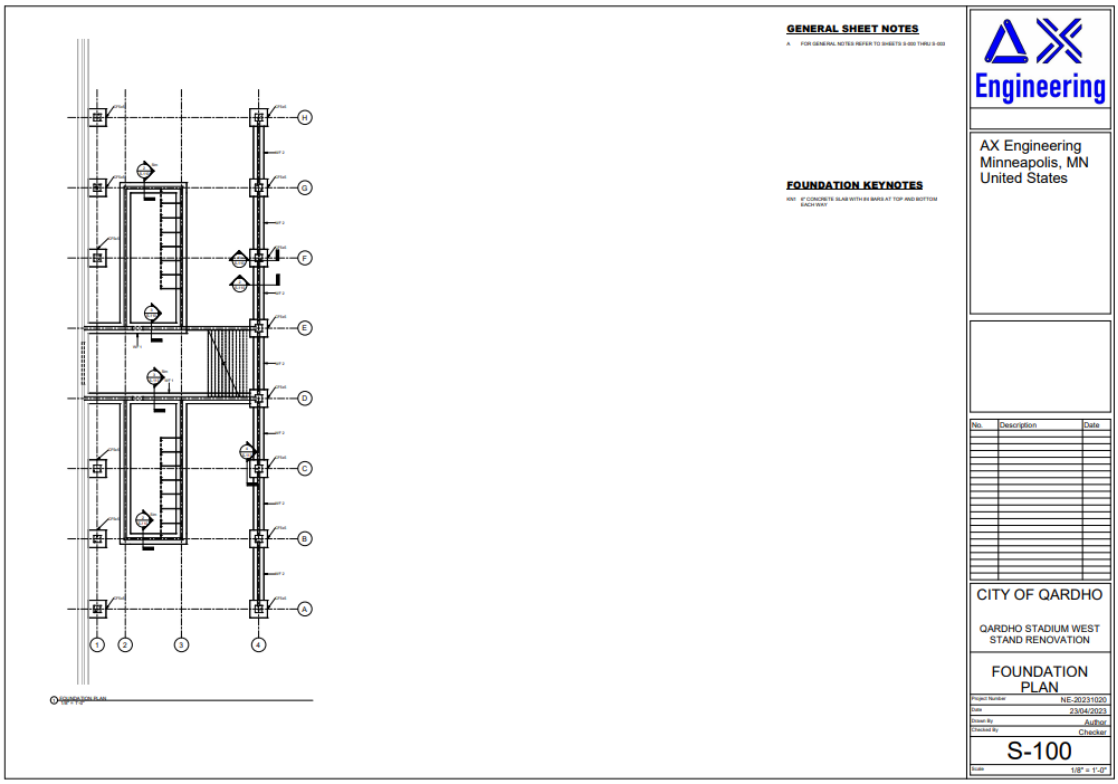
4.6 Total Cost Estimate

Collating all the items above, the total cost of this project is conservatively estimated to be approximately $221,060.

This cost estimate is a rough order of magnitude estimate and the actual cost of the construction of this project will be based on local conditions, current market rates at the time of constructions, and specific project requirements after final schematic design has been completed.

5.0 Appendix 1: Preliminary Plans

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Minneapolis, MN
United States
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QARDHO STADIUM WEST STAND RENOVATION
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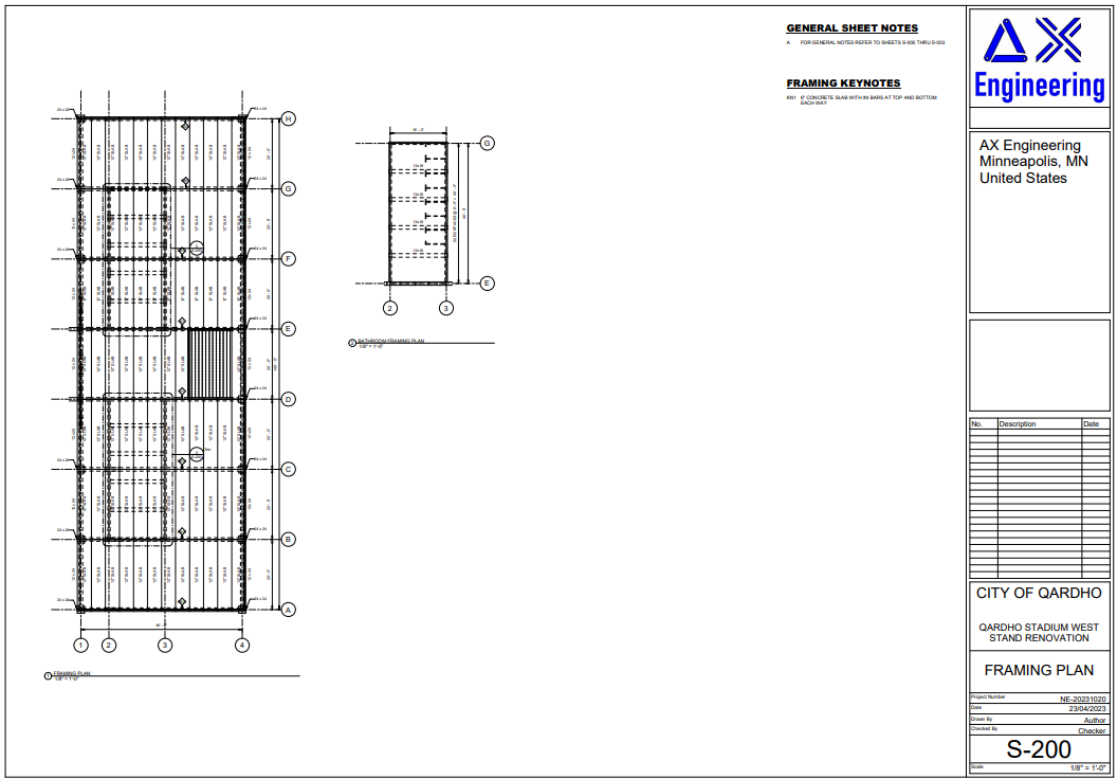
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Date 23/04/2023
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